UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

DEC 17 1996

30215682
Superfund

Memorandum

SUBJECT: Record of Decision for Des Moines TCE Superfund Site

FROM: Michael J. Sanderson
Director, Superfund Division

TO: Dennis Grams, P.E.
Regional Administrator

I am submitting for your approval the attached Record of Decision (ROD) for Operable Units (OU) 2 and 4 of the Des Moines TCE Superfund Site in Des Moines, Iowa. I have reviewed the package and recommend your approval of the ROD. Please indicate your approval by signing the ROD Declaration.

This ROD presents the selected remedy to address contamination in OU2 and OU4 remaining after three previous removal actions. The selected remedy calls for continued maintenance of the previous removal actions and land use restrictions to maintain an industrial land use.

A public meeting was held on June 11, 1996, to present the preferred remedy to the public and to receive feedback regarding public acceptance of the remedy. During the meeting, members of the public were generally supportive of the remedy. Several comments were received during the public comment period. The U.S. Environmental Protection Agency's (EPA) response to the comments is found in the responsiveness summary in the ROD. The Iowa Department of Natural Resources (IDNR) has provided a letter to EPA indicating its general agreement with the selected remedy.

If you have questions or concerns regarding the selected remedy, please contact me or Mary Peterson, the project manager, at extension 7882.

Attachment

cc: Bob Drustrup, IDNR

RECYCLE
PAPER CONTAINS RECYCLED FIBERS

RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Des Moines TCE Site
Operable Units 2 and 4
Des Moines, Iowa

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for operable units 2 and 4 (OU2 and OU4) of the Des Moines TCE Superfund Site in Des Moines, Iowa. The remedies have been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

The Iowa Department of Natural Resources (IDNR) is in agreement with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened exposures to hazardous substances in OU2 and OU4, if not addressed by implementing the remedial actions selected in this record of decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected remedy is the final remedial action for OU2 and OU4, and represents the final remedial action for the Des Moines TCE Site. A significant amount of risk reduction was achieved by a series of three removal actions conducted in OU2 and OU4. The removal actions accomplished the following activities:

- Building Removal Action: Contaminated dust was removed from interior surfaces of several onsite buildings. Protective coatings were applied to the walls and floors of the buildings to encapsulate any residual contamination. Contaminated insulation materials were replaced or repaired, and a former aldrin tank and surrounding structure and soils were dismantled and removed from the site.

- Surface Cap Removal Action: An asphalt cap was constructed as a protective cover over the majority of contaminated soils in OU2 and OU4.

- South Pond Area Removal Action: Contaminated soils were excavated and transported offsite for disposal.

The selected remedial action will provide for the continuation of the risk reduction achieved by the removal actions, and will ensure the overall protectiveness by restricting use of the property to industrial activities. The main components of the selected remedy include:

- Maintenance activities as called for by the response action Operation and Maintenance (O&M) Plans;
- Periodic seal coats applied to the existing asphalt cap;
- Sampling of soils at the South Pond discharge area during CERCLA reviews; and
- Land use restrictions to maintain industrial use of the property.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are applicable or relevant and appropriate, and is cost effective. The selected remedy utilizes permanent solutions to the maximum extent practicable. Cleanup actions already performed as part of the OU4 removal actions removed the soils most highly contaminated with pesticides and herbicides for off-site disposal. EPA evaluated alternatives involving excavation and off-site disposal of additional pesticide and herbicide contaminated soils, but found those alternatives did not provide an appreciably higher degree of protectiveness than the capping alternative so long as the cap is properly maintained. The selected remedy utilizes alternative treatment technologies or resource recovery technologies to the maximum extent practicable. EPA evaluated treatment alternatives in the feasibility study, but found they did not provide an appreciably higher degree of protectiveness and were not cost effective. Because the selected remedy will result in hazardous substances remaining onsite, EPA will conduct a review of the adequacy of the selected remedial actions no less often than every five years as required by Section 121 of SARA.

12-13-96
Date

Dennis Grams, P.E.
Regional Administrator

TABLE OF CONTENTS
DES MOINES TCE OPERABLE UNITS 2 AND 4
RECORD OF DECISION SUMMARY

RECORD OF DECISION SUMMARY
DES MOINES TCE SITE
OPERABLE UNITS 2 AND 4
DES MOINES, IOWA

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Des Moines TCE site is located in the south central portion of the city of Des Moines, Iowa, adjacent to the Raccoon River. The site includes a portion of the Des Moines Water Works facility, the Dico, Inc. (Dico) property, the industrial area north of the Raccoon River, the Tuttle Street landfill to the east, and the Frank DePuydt woods to the south. In all, the Des Moines TCE site encompasses more than 200 acres and has been divided into four operable units by the EPA. Operable units 2 and 4 (OU2 and OU4) are the subject of this record of decision (ROD). A site map is presented on Figure 1 which depicts the boundaries of OU2 and OU4.

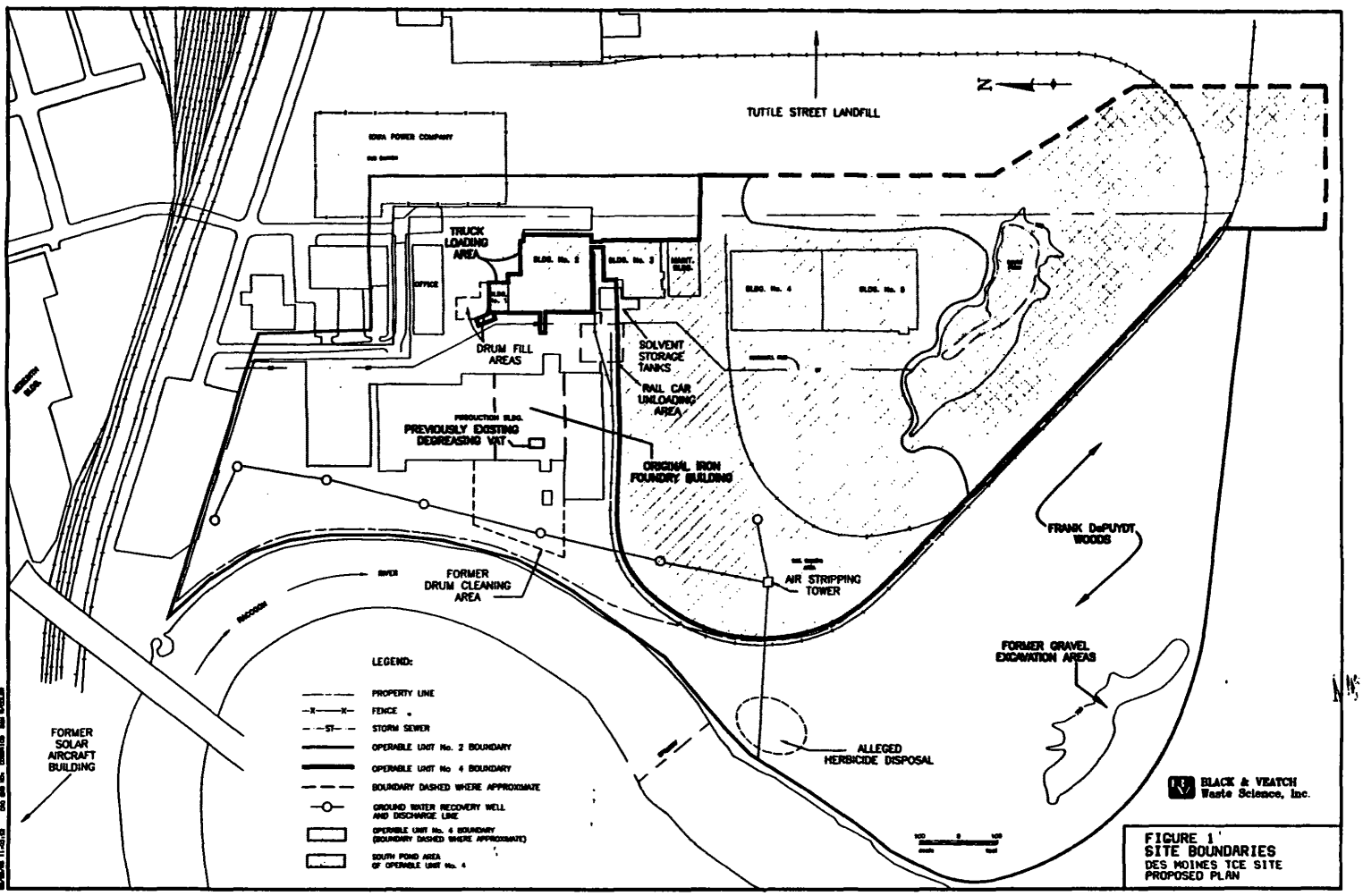
Operable Unit No. 1 (OU1) involves the remedy to address the volatile organic compound (VOC) contamination in the ground water that has threatened the Des Moines public water supply. A remedy, including a ground water extraction, treatment, and monitoring system, was designed and is being implemented by Dico.

OU2 consists of the Dico property and a portion of the Frank DePuydt Woods and was originally referred to as the South Area Source Control. OU2 originated to address the sources related to the ground water contamination being addressed under OU1. Eventually OU2 was subdivided to separately address the issues and area related to the VOCs (now the revised OU2) and the area which involved the formulation of pesticides and herbicides (now OU4). A remedial investigation (RI) was completed for OU2 by Dico in 1993. Late in 1994, efforts to complete the OU2 feasibility study (FS) were combined with efforts for the OU4 FS.

Operable Unit No. 3 (OU3) is located north of the Dico property. EPA conducted the OU3 RI/FS and signed the OU3 Record of Decision (ROD) in September 1992. Contaminant levels found in the OU3 area were significantly lower than contaminant levels found in the areas to the south on and around the Dico property. Results of the OU3 RI did not indicate any of the properties in the OU3 area are a source of contamination. The OU3 ROD provided for continued ground water monitoring and acknowledged that the OU1 remedy is capturing this low level contamination. The industrial area north of the Dico property remains a part of the Des Moines TCE Site in that remedial activities consisting of ground water monitoring continue. The Iowa Department of Natural Resources (IDNR), through a Superfund State Contract, is conducting this monitoring.

OU4 has been defined by EPA to include portions of the Dico property, Buildings 1 through 5 and the Maintenance Building and surrounding soil; soil and sediment associated with the former aldrin tank and South Pond Area; and the drainage channel south and east of the Dico property up to the railroad spurs owned by the Norfolk Southern Corporation.

Land use in the vicinity of the site is commercial/industrial. As of 1990, the Planning Department of the city of Des Moines has designated the Dico property as "heavy industrial district" while the southern portion of OU4 is designated as "floodplain". A drainage area on the Dico property known as the South Pond is a wetland area.



ED_001521A_00011269-00008

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Facility History

The Dico property has been used for a variety of industrial uses, including a grey iron foundry, a steel wheels manufacturing plant, chemical and herbicide distribution, and pesticide formulation processes. During the various activities over the years, Dico or related companies have modified surface features at the site through the construction of several buildings and other regrading activities that affected drainage patterns and other site features. The buildings were apparently constructed in phases as various industrial processes were initiated at the site. Drainage patterns across the site changed significantly over time because of the construction of a flood control levee; the installation of a storm water bypass to the Raccoon River, which redirected storm water from a large area to the north of Dico; and the enclosure of the main drainage channel through the Dico property, and capping of a large portion of the site.

Some of the activities conducted within the OU2 and OU4 areas involved bulk chemical storage and distribution. As reported in the OU2 RI, DiChem, formerly located in Buildings 1 through 5 of OU4, purchased bulk quantities of various solvents for repackaging and distribution to commercial clients in the 1950s and 1960s. These solvents included perchloroethylene, TCE, toluene, xylene, and 1,1,1-trichloroethane. The solvents were stored in large aboveground containers and then packaged in 55-gallon drums for distribution. A drum cleaning area was located to the west of the Dico Production Building. The drum fill area was located immediately north of Building 1. DiChem also distributed quantities of hydrochloric, phosphoric, and sulfuric acids from the 1940s through the 1970s.

Other activities conducted almost exclusively within the OU4 area involved pesticide and herbicide formulation. Buildings 1 through 5 and the Maintenance Building were used by DiChem for the formulation of technical grade pesticides and herbicides into products for sale. The primary formulation activities were conducted within Buildings 2 and 3 while Buildings 4 and 5 were primarily used for chemical storage and delivery and product storage. These activities reportedly occurred from the mid-1950s through the early 1970s.

2.2 Site History

The Regional Administrator signed a ROD for OU 1 on July 21, 1986. The OU1 remedial action includes the capture and extraction of contaminated ground water by recovery wells, treatment of the recovered ground water, and monitoring an extensive ground water well network to verify the effectiveness of the ground water capture system. EPA issued Dico an administrative order pursuant to section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), requiring it to implement the selected remedial acion.

On August 8, 1989, Dico entered into an administrative consent order pursuant to sections 104 and 122 of CERCLA, which required Dico to conduct an RI/FS for OU2 (OU2 RI/FS Order). When Dico began the OU2 RI, OU2 encompassed all of Dico's property. However, during the OU2 RI, portions of the Site, including soils and several Dico buildings, were found to be contaminated with pesticides and herbicides, apparently resulting from pesticide formulation operations conducted in the 1950 to 1970 time period. This area was separated out of the OU2 investigation geographically as a separate operable unit, OU4.

The OU2 RI/FS Order called for a phased submittal of an RI report, and, after EPA approved the RI report, submittal of the FS report. Dico completed an OU2 RI Report which EPA approved in February 1993. In addition to the OU2 RI, Dico and EPA conducted several additional investigations, focusing on specific areas

and contaminants of concern. Dico submitted an OU2 FS Report under the Order, but the report was not finalized.

In July 1993, flood waters from the Raccoon River inundated the site and deposited several inches of sediment within the Dico buildings. Dico personnel flushed some of the sediment from the buildings following subsidence of the flood waters to retrieve inventory contained in Buildings 1 and 2. However, the majority of the sediments and inventory remained in the buildings until they were cleaned in accordance with an EPA-approved plan.

In the fall of 1993, Titan Wheel International Inc. (Titan) purchased the Dyneer Corporation, Dico's corporate parent. In the summer of 1995, Titan closed the Dico plant and transferred its wheel manufacturing operations to another facility in Des Moines. Currently, only limited operations are being conducted at the site. Titan's future plans for the site are unknown at this time.

2.3 Response Actions in OU2 and OU4

Following Titan's purchase of Dico's corporate parent in 1993, Titan expressed interest in expediting cleanup of the OU2 and OU4 areas to enable it to resume pre-flood activities. In addition, a group of chemical companies potentially liable for the pesticide contamination, also indicated its interest in expedited cleanup actions. In response to these parties, EPA issued three action memoranda and corresponding administrative orders, each calling for response actions to address threats in specific areas of OU2 and OU4. Descriptions of the three removal or response actions are provided below.

For purposes of this ROD, EPA assumes that all response action construction has been properly completed and that the required maintenance activities are being properly conducted. However, if the Respondents to the administrative orders fail to comply with the orders, the EPA may reevaluate remedial alternatives, and may take whatever actions are necessary to protect public health and the environment over the long term.

2.3.1 Building Response Action

In March 1994, EPA signed an action memorandum to address contamination associated with various interior portions of DICO Buildings 1 through 5 and the Maintenance Building, and the former aldrin mixing tank, annex, and surrounding soils. The action memorandum called for cleaning of the interior surfaces of the buildings, demolition and disposal of the aldrin tank and annex structure, excavation and disposal of the soils surrounding the aldrin tank, encapsulation of building walls and floors, and securing of building insulation. The action memo also called for development of a response action maintenance plan to ensure the continued integrity of the cleaning and encapsulations actions. A Unilateral Adminstrative Order (UAO) was issued to Dico to conduct the work. To date, the substantive portions of the work required by the action memo have been completed.

2.3.2 Surface Capping Response Action

In June 1994, EPA signed a second action memorandum calling for a removal action to address the threats associated with pesticide contamination of soils in OU2 and OU4. Specifically, the action memo required either excavation of soils or the capping of soils containing the pesticides aldrin, dieldrin, and chlordane above specified health-based levels. A UAO was issued to Dico requiring it to conduct the work. Dico selected the capping

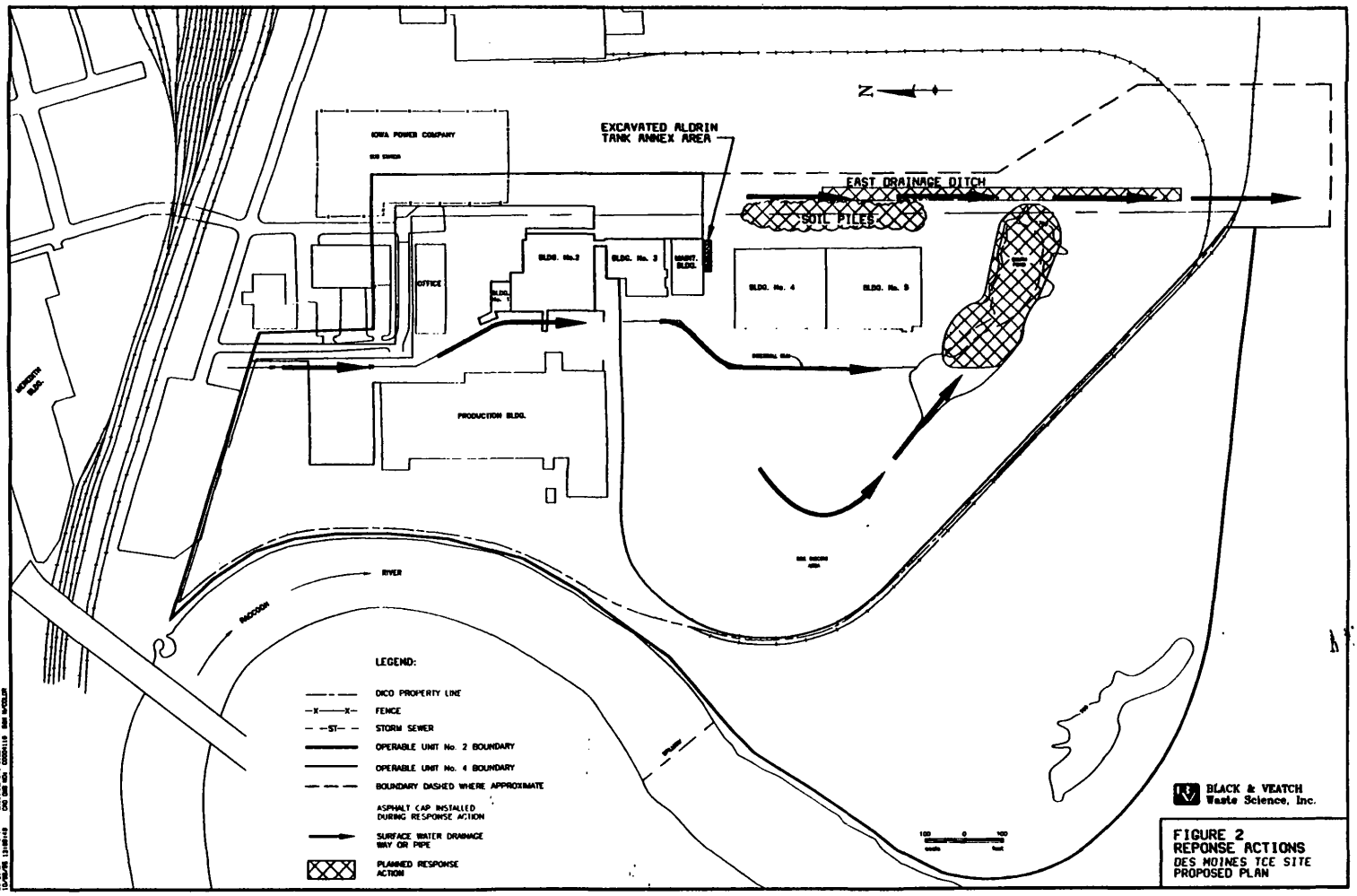
alternative and constructed an asphalt cap over a large portion of both the OU2 and OU4 areas. The action memo also required a response action maintenance plan to ensure the continued integrity of the cap.

2.3.3 South Pond Area Response Action

In December 1995, EPA signed an action memorandum to remove or reduce the threat presented by contaminants in soils and sediments found in and around the South Pond Area (SPA), in stockpiled soil resulting from excavations in the drainage ditch adjacent to and east of the DICO facility, and remaining in the drainage ditch. An Administrative Order on Consent (AOC) was negotiated with a group of chemical companies known as the DiChem Customer Group to conduct the required work. The DiChem Customer Group retained Burns and McDonnell Waste Consultants, Inc. (B&M) to conduct the work on its behalf. The South Pond Area Removal Action Work Plan (B&M 1996) describes the characterization and removal activities that were conducted . The plan calls for characterization of soils around the SPA and excavation of soils containing aldrin, dieldrin, and chlordane above health-based cleanup levels. Excavated soils were transported to an EPA-approved offsite facility for disposal. Construction activities for this response action were completed in September 1996. The action memo also calls for post removal monitoring to ensure that contaminated sediments remain in the bottom of the South Pond, and do not wash out into the east drainage ditch.

2.4 Other Enforcement Activities

Dico continues to operate the groundwater extraction and treatment system for OU1 pursuant to the a CERCLA Section 106 administrative order issued by EPA on July 21, 1986. On April 21, 1995, the United States filed a civil complaint against Dico seeking reimbursement of EPA's responsive costs associated with OU1. That matter is currently in litigation.



ED_001521A_00011269-00012

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS and Proposed Plan for OU2 and OU4 of the Des Moines TCE Site were made available to the public on June 3, 1996. These two documents are part of the administrative record for the site which has been available for review by the public at the Des Moines City Library. The notice of availability of these documents was published in the Des Moines Register on June 3, 1996. A public comment period was held from June 3, 1996 through July 5, 1996 and a public meeting was held in Des Moines, Iowa on June 11, 1996. At this meeting, representatives from the EPA Region 7 presented the preferred remedial alternatives for OU2 and OU4, and provided the opportunity for public comments. A response to the comments received at the public meeting and during the public comment period is included in the Responsiveness Summary attached to this ROD.

4.0 SCOPE AND ROLE OF OPERABLE UNITS

Remedial action at the Des Moines TCE site is being implemented through a sequence of four operable units. The phasing of cleanup actions at the Des Moines TCE site has provided the opportunity to achieve significant risk reduction more quickly than addressing the entire site at one time. As previously mentioned, remedial actions for OU1 and OU3 consisting of groundwater extraction and treatment and long term monitoring are ongoing.

The response actions conducted within OU2 and OU4 served to significantly reduce the risk to human health and the environment in these areas. However, contamination remaining in OU2 and OU4 continues to present a threat to human health and the environment. Remaining threats in OU2 and OU4 include unacceptable risks due to potential exposure of onsite workers and residents to contaminated soils beneath the surface cap. In addition, contaminated soils beneath the surface cap present a continued threat to the environment through the potential leaching of contaminants to the groundwater. The remedial action authorized by this ROD will provide for long term risk reduction in OU2 and OU4, and will be the final remedial action for the site.

5.0 SUMMARY OF SITE CHARACTERISTICS

This section describes the conditions as defined by several separate investigations of the OU2 and OU4 areas of the site. More detailed information regarding the results of the investigations can be found in the OU2 RI report and addendum (Eckenfelder 1993) and the OU4 RI report (Black and Veatch 1995).

5.1 Operable Unit 2

5.1.1 Surficial Contamination

Contaminants detected in OU2 soils include VOCs, metals, polychlorinated biphenyls (PCBs), and pesticides. Areal distribution of the contaminants is widespread across OU2. The contaminants which contributed most significantly to health risks in OU2 include the pesticides aldrin, dieldrin, and chlordane. All of the OU2 soils known to be contaminated have been covered by an asphalt cap as a result of the surface cap response action conducted in 1994, and are no longer accessible for exposure provided the cap is properly maintained. The maximum concentrations of contaminants found above health-based cleanup levels in OU2 include 0.036 mg/kg aldrin, 7.9 mg/kg dieldrin (for a combined maximum aldrin/dieldrin concentration of 7.936 mg/kg),and 4,880 mg/kg lead. (See OU2 RI) While contamination is widespread across OU2, certain areas contain higher concentrations of contaminants. For example, the highest concentrations of pesticides are found east, northwest, and south of the Production Building and north of Building 1. Elevated lead levels up to 4,880

mg/kg are found in surface soils along the west side of the Production Building. The above levels of contaminants remain beneath the surface cap in OU2.

5.1.2 Subsurface Soils

The original purpose of the OU2 RI was to locate the sources contributing to the groundwater VOC contamination being addressed by OU1. The OU2 RI report provides detailed information regarding the concentrations and locations of VOCs in OU2 subsurface soils. In general, the highest concentrations of VOCs (55,000 ug/kg TCE, 130,000 ug/kg 1,2-dichloroethylene [1,2-DCE]) were found in the vicinity of the previously existing degreasing vat and nearby former drum cleaning area. The concentrations of VOCs are of the same order of magnitude in both the surficial fill material and deeper natural soils. The presence of these compounds at depth suggests that the downward migration of the compounds has occurred.

In 1991, Dico conducted a treatability study to evaluate the potential effectiveness of vapor stripping technologies to treat the subsurface VOC contamination. The treatability study concluded that in-situ vapor stripping was not a viable option due to low vapor flow rates and VOC removal rates achieved during the study.

While the surface soils in OU2 contain elevated levels of pesticides and metals, these contaminants are not found above health-based levels of concern at depth. The analytical results indicate that the pesticides in shallow soils are relatively immobile and that the metals contamination is not widespread in OU2.

Overall, the VOCs in OU2 subsurface soils do not pose a significant direct contact human health risk because they are located below ground which prevents direct contact exposures. With the construction of the asphalt surface cap, direct contact exposures to VOCs are further prevented and the effect of leaching VOCs to groundwater via surface infiltration is reduced because surface water will drain from the cap rather than infiltrate through the soils. In addition, any contaminants which reach groundwater will ultimately be captured by the OU1 groundwater treatment system. EPA, therefore, does not believe that additional actions are necessary to address the subsurface VOC contamination in OU2.

5.2 Operable Unit 4

OU4 investigations included characterization of Buildings 1-5 and the Maintenance Building and surrounding soils, the former aldrin tank and annex area, a drainage ditch east of Buildings 4 and 5, stockpiled soil piles adjacent to the drainage ditch, and the SPA.

5.2.1 OU4 Buildings

The primary contaminants detected in Buildings 1-5 and the Maintenance Building were aldrin, dieldrin, chlordane, PCBs, and dioxin. The highest levels of aldrin, dieldrin, and chlordane were found in the concrete floor of the Maintenance Building at concentrations of 7,680 mg/kg, 69.6 mg/kg, and 30.5 mg/kg, respectively. Lower levels of aldrin, dieldrin, and chlordane were found in Buildings 2, 3, and 4. Dioxin was found only in the concrete floor of Building 2 at a concentration 0.00623 mg/kg. PCBs were found in the insulation of Buildings 2-5 and the Maintenance Building. The highest concentration found was 29,000 mg/kg in Building 3. The only location where PCBs were not isolated in the building insulation occurred in Building 4 where PCBs were detected in a wipe sample of the concrete floor. This incident is believed to be the result of damaged ceiling insulation which accumulated on the floor. Detailed information regarding the concentrations and locations of contaminants can be found in the OU4 RI report.

The majority of the contamination was removed from the buildings as a result of the cleaning actions which removed contaminated dust from the buildings. However, residual pesticide contamination may remain beneath the surface coatings applied to the walls and floors of the buildings, and PCB contamination remains in the building insulation. The levels of aldrin, dieldrin, chlordane, and dioxin which may remain beneath the surface coatings have not been determined. The building insulation was taped and secured in place to prevent exposure to the PCBs.

The OU4 soil data indicate that pesticides were released from the buildings to the outside soils. If proper maintenance of the surface coatings applied to the building walls and floors is not effectively implemented, residual pesticides may again be released to the surrounding environment. Potential migration pathways include personnel and vehicular traffic and any drainage from the buildings.

5.2.2 Surface Soils

The various OU4 investigations revealed that aldrin, dieldrin, chlordane, and dioxin are present in the surface and shallow subsurface soils. Aldrin, dieldrin, and chlordane were found above health-based cleanup levels at numerous locations across OU4. The highest concentration of aldrin was 10.0 mg/kg detected in the surface soil at the northwest corner of Building 4. Dieldrin was found at a maximum concentration of 26.0 mg/kg in the surface soil located east of the Maintenance Building. The maximum concentration of chlordane, 18.4 mg/kg, was found in the surface soil at the southwest corner of the Maintenance Building.

5.2.3 South Pond Area

The South Pond Area (SPA) includes the South Pond and surrounding soils, the drainage ditch east of the Dico property, and stockpiled soil piles between Buildings 4/5 and the east drainage ditch. Through the various OU4 investigations, samples were collected from each of these areas to determine the extent of contamination.

Surface soils around the South Pond contained various levels of aldrin, dieldrin, and chlordane. Aldrin and dieldrin were the only contaminants found above health-based cleanup levels. The maximum concentrations were 3.6 mg/kg aldrin and 59.0 mg/kg dieldrin which were found in the surface soils along the northwestern edge of the pond. Sediment samples collected from the bottom of the pond also contained aldrin and dieldrin above health-based cleanup levels. The highest concentration of aldrin found in sediment was 7.3 mg/kg and the highest concentration of dieldrin found in the sediment was 17.0 mg/kg.

Samples collected from the east drainage ditch contained combined concentrations of aldrin and dieldrin up to 7 mg/kg. The stockpiled soil piles contained a maximum combined aldrin and dieldrin concentration of 3.5 mg/kg.

Assuming the SPA removal action is conducted as required by the action memorandum, all contamination above health-based cleanup levels will have been removed from around the South Pond, the east drainage ditch, and stockpiled soil piles. These soils will be excavated and removed from the site for offsite disposal. The SPA response action will not address the South Pond sediments, so the levels of aldrin and dieldrin presented above will remain in the bottom of the pond.

5.3 Media and Contaminants of Concern

Following completion of construction activities associated with the SPA response action, there will remain only three points sampled during the OU2 and OU4 investigations which have not been addressed by one of the response actions. None of these points contained contaminants above a level of concern.

Currently, assuming completion of the SPA response action construction, contamination remaining in OU2 and OU4 includes:

- Pesticides and metals in surface soils of OU2 which have been covered by an asphalt cap;
- VOCs in surface and subsurface soils of OU2 which have been covered by an asphalt cap;
- Residual pesticides beneath the surface coatings in Buildings 2,3,4, and the Maintenance Building;
- PCBs in the insulation of Buildings 2-5 and the Maintenance Building;

6.0 SUMMARY OF SITE RISKS

During the RI/FS process for OU2 and OU4, various evaluations were performed to estimate the health or environmental problems that could result if the soil contamination was not cleaned up. These evaluations are commonly referred to as baseline risk assessments (BRAs). The baseline risk assessments evaluated the potential adverse effects to human health and the environment presented by OU2 and OU4 under current and projected future land use conditions. Six baseline risk assessment documents have been developed for OU2 and OU4 of the Des Moines TCE Site, and are listed below.

- OU2 Baseline Risk Assessment which includes results from the OU2 RI for soil.
- OU2 Risk Assessment Memorandum which is presented as an addendum to the OU2 Baseline Risk Assessment to address a potential future residential population.
- OU2 Assessment Addendum which revises the original BRA based on data collected following flooding of the site in the summer of 1993.
- OU4 Building Removal Action Risk Assessment Memoranda which address contamination in the buildings, including surface contamination and air contamination.
- OU4 Focused Risk Assessment Memorandum addresses contamination in the South Pond Area, stockpiled soils and the East Drainage Ditch.
- OU4 Baseline Risk Assessment which addresses soil and sediment contamination not evaluated by the previous risk assessments for OU4.

Each of these risk assessment documents was prepared to evaluate potential risks to human health and the environment for specific exposure scenarios of interest, given the nature and extent of site contamination in various areas of OU2 and OU4.

6.1 Contaminant Identification

6.1.1 Operable Unit 2

For the OU2 BRA, various site media were evaluated including surface and subsurface soils, sediments, groundwater, and surface water. The site media were analyzed for 150 constituents including the categories of VOCs, semi-VOCs, pesticides/PCBs, and inorganics. To reduce the number of constituents of interest to a manageable number, several constituents were eliminated based on the following guidelines :

- Any constituent not detected at least once in a given media;
- Laboratory contaminants;
- Naturally-occurring constituents;
- Constituents determined to be due to anthropogenic sources;
- Low frequency and range of detection; and
- EPA's Concentration-toxicity screening procedure.

Upon completion of the elimination process, 25 constituents of interest were retained for evaluation in the risk assessment (Eckenfelder 1993). Table 2-16 from the OU2 BRA lists these 25 constituents and the affected media, and is included as Appendix A. The upper 95th confidence limit (UCL) concentrations of the constituents of interest were used to evaluate the associated risks.

6.1.2 Operable Unit 4

To evaluate the risks associated with OU4, three separate risk assessments were conducted in association with the three areas which were the subject of response actions. Risks were evaluated separately for Buildings 1-5 and the Maintenance Building, the South Pond Area, and the remaining area of OU4 including the capped area and all other areas not evaluated by the first two risk assessment efforts.

Buildings 1-5 and the Maintenance Building

The constituents for which health risks were evaluated include nine pesticides and herbicides and PCBs as listed in Appendix B. The affected media for which exposure pathways were identified includes dust inside the buildings and soil outside the buildings. The 95th UCL concentrations were used to evaluate the associated risks. (OU4 Building Removal Action Risk Assessment Memorandum, 1992)

South Pond Area

A Focused Risk Assessment memorandum was prepared to evaluate current recreational exposures and potential future occupational and residential exposures in the South Pond Area. This risk assessment evaluated risks due to 31 constituents in soil and sediments. A list of the 31 constituents is included as Appendix C. Risk calculations were based upon the 95th UCL concentrations. (OU4 Focused Risk Assessment Memorandum, 1995)

OU4 Capped and Exposed Soils

The OU4 BRA was prepared to evaluate the risks posed by contaminated soils remaining beneath the asphalt cap as well as areas in OU4 which were not addressed by the earlier risk assessments (Buildings, and South Pond Area). The media of interest in the OU4 BRA include surface soils (0-2') for current exposure scenarios, and deep soils (0-12') for future exposure scenarios. Using data collected from several different investigations, the OU4 BRA considered 68 constituents of interest including VOCs, semi-VOCs, pesticides, dioxins, and inorganics. The 95th percent UCL concentrations were used in the risk characterization calculations, except where the data set was comprised of fewer than 10 data points. For the latter case, the highest detected concentration was used. (Black and Veatch 1995) Two tables from the OU4 BRA showing the exposure point concentrations for the constituents of interest for both capped and exposed soils are included as Appendices D and E.

6.2 Exposure Assessment

6.2..1 Operable Unit 2

The OU2 risk assessments evaluate numerous potential exposure pathways for the various media under then current and potential future land use scenarios. Risks associated with groundwater exposures were not quantified because the existing groundwater extraction and treatment system was assumed to prevent current and future groundwater exposures. (Eckenfelder 1993)

Under the current land use scenario, exposure pathways for occupational and recreational populations were evaluated in the OU2 BRA. The exposure pathways for which risks were quantified include site workers and persons recreating at the site (both adults and children) exposed to surficial and shallow soils through incidental ingestion and dermal contact. In addition, risks were quantified for a recreational child exposed to surface water and sediment through incidental ingestion.

The OU2 BRA assumed future land uses to be limited to industrial and recreational activities. The exposure pathways for which risks were quantified include site workers and persons recreating at the site exposed to surficial and shallow soils through incidental ingestion and dermal contact. Exposure of children to surface water and sediment through incidental ingestion was also quantified.

Ecological exposure pathways were identified under both current and future land use scenarios for terrestrial, avian, and aquatic biota. Ecological risks associated with these pathways were not quantified, but were evaluated qualitatively in the OU2 BRA.

Other risk assessments prepared for OU2 evaluated a future residential land use scenario. The exposure pathways quantified include potential future workers and residents exposed to surface and subsurface soils. Surface soils included soils from the ground surface to two feet below ground. Subsurface soils included soils from a depth of six inches below ground surface to all depths from which soil samples were collected.

6.2.2 Operable Unit 4

Buildings 1-5 and the Maintenance Building

Risks were quantified for occupational workers exposed via inhalation of contaminated dust inside the buildings, and incidental ingestion and dermal contact with contaminated soil outside the buildings.

South Pond Area

The OU4 Focused Risk Assessment evaluated current recreational exposures and future occupational and residential exposures. Under the current industrial land use scenario, risks were quantified for persons recreating in the area exposed to contaminated soils and sediments through incidental ingestion and dermal contact

OU4 Capped and Exposed Soils

In the OU4 BRA, no human populations were determined to be exposed to soils beneath the asphalt cap under a current site use scenario. The only current exposure involved recreational populations exposed to soils not covered by the asphalt cap.

Future land use scenarios evaluated in the OU4 BRA included a future industrial use and a future residential use. Future worker and resident exposure pathways including incidental ingestion and dermal contact with soils beneath the asphalt cap were evaluated. In the same way, future workers and residents exposed to soils not covered by the asphalt cap were evaluated.

6.3 Toxicity Assessment

While numerous constituents of interest were evaluated in the various risk assessments, three pesticides, aldrin, dieldrin, and chlordane, contributed most substantially to the overall risks. Toxicity information regarding these primary contaminants is presented in this section. Toxicity information regarding the other contaminants can be found in the risk assessment documents listed above in Section 6.0.

Health hazards for chemicals exhibiting non-carcinogenic (non-cancer) effects are evaluated using established reference doses (RfDs). The RfD is an estimate of the daily exposure to the human population that is not likely to be harmful over a lifetime. RfDs are expressed in units of mg/kg/day and are usually derived from animal studies or in some cases from human studies involving workplace exposures.

Health risks for chemicals exhibiting carcinogenic (cancer) effects are evaluated using established slope factors (SFs). SFs are used to estimate the upper-bound excess lifetime cancer risk associated with lifetime exposure to potential human carcinogens. Excess cancer risk is calculated based on the average daily intake over a lifetime and the cancer SF.

Aldrin, dieldrin, and chlordane are classified by EPA as probable human carcinogens, which means that there is sufficient evidence of carcinogenicity from animal studies, but insufficient evidence from human studies. The RfDs and SFs for aldrin, dieldrin, and chlordane for both ingestion and dermal exposures are shown in Table 6-1. Because toxicity values are routinely updated, Table 6-1 reflects the values from the OU4 BRA, which contains the most recent toxicity information.

Table 6-1
Toxicity Values

	Oral SF (kg-day/mg)	Oral RfD (mg/kg-day)	Dermal SF (kg-day/mg)	Dermal RfD (mg/kg-day)	Target Organ
Aldrin	17	3.0×10^{-5}	340	1.5×10^{-6}	liver
Dieldrin	16	5.0×10^{-5}	320	2.5×10^{-6}	liver
Chlordane	1.3	6.0×10^{-5}	26	3.0×10^{-6}	liver

6.4 Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level with the SF. These risks are probabilities that are generally expressed in scientific notation. An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. EPA considers carcinogenic risk greater than $1x10^{-4}$ to be unacceptable, generally triggering a response action to reduce to the risk.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ). The HQ is the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's RfD. By adding the HQs for all contaminants within a medium or across all media of interest, the hazard index (HI) can be generated. The HI provides a reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. EPA generally considers an HI greater than 1.0 to be unacceptable.

For OU2, the current exposure scenarios evaluated in the three risk assessments prepared for OU2 are no longer applicable because the exposure pathways have been eliminated through capping during the response actions. Assuming the response actions are properly maintained, the only remaining risk in OU2 involves a future residential exposure scenario which poses unacceptable non-carcinogenic risks up to HI=22 and carcinogenic risks up to $2x10^{-3}$. The contaminants contributing the most significant risk are aldrin, dieldrin, and chlordane.

For OU4, most of the current exposure scenarios evaluated are no longer applicable because the exposure pathways have been eliminated through capping or encapsulation conducted during the response actions. Until the SPA response action is conducted, a current exposure scenario remains valid for people recreating near the South Pond. Following the response action planned for the South Pond area, this exposure pathway will also be eliminated. Assuming the response actions are properly maintained, the only remaining risks in OU4 will involve future residents and workers exposed to soils beneath the asphalt cap.

The risks to future site workers evaluated in the OU4 BRA are associated with surface and shallow soils which have been covered by an asphalt cap. Risks to these site workers include both a carcinogenic risk of $1.7x10^{-3}$ and a noncarcinogenic hazard index of 9.7. These risks would be realized if the cap is not properly maintained and workers become exposed to the underlying soils.

For the future residential scenario, unacceptable risks are present for both adult and child residents exposed to soils beneath the asphalt cap. The excess carcinogenic risk associated with this exposure pathway is $3x10^{-2}$ and the hazard index for noncarcinogenic effects is 144.

The OU4 BRA concludes that the protective cover must be maintained to ensure that risks to site workers are eliminated and that future use of the site must be restricted to prevent residential development unless further remedial action is implemented.

6.5 Environmental Risks

Environmental risks were evaluated in the OU2 BRA. Exposures to biota from contaminated media in OU2 include terrestrial (land) animals and avian (bird) species. Soil exposures may be associated with such activities as feeding, nesting, or burrowing, and surface water exposures may also exist in the vicinity of the South Pond.

Detailed ecological assessment was not conducted during the OU2 BRA. Field personnel during site visits noted that the southern portion of OU2 (in particular the South Pond and Frank Depuydt Woods) is heavily vegetated and appears to provide habitat for several species of birds and mammals. The OU2 BRA reports no visible adverse impacts on animal species, and concludes that the potential for such adverse impacts is not expected to be significant. (Eckenfelder 1993)

Exposure to aquatic biota are potentially present in the South Pond according to the OU2 BRA. However, no aquatic biota surveys were completed, and the species existing in the South Pond were not determined. The IDNR indicated during the OU2 BRA that there are no endangered species, threatened species, critical habitats, or significant natural communities within a three mile radius of the site. As for terrestrial and avian biota, the OU2 BRA concludes that the possibility of adverse impacts to aquatic biota exists in the vicinity of the South Pond, but the degree of impact is not expected to be significant.

Concurrent with the OU4 BRA, a Wildlife Toxicity Assessment was conducted. This assessment concluded that there may be significant ecological risks associated with portions of OU4, particularly the South Pond. However, remedial actions in the South Pond and surrounding wetland area would physically alter or eliminate the habitat the action is intended to remediate. The assessment concluded that remedial actions in the wetland area should reduce or eliminate the exposure threat to contaminated media, while preserving the natural habitat to the extent possible. (Black and Veatch 1995)

7.0 DESCRIPTION OF ALTERNATIVES

Remedial alternatives were developed in the feasibility study (FS) for each area which was the subject of a response action: Buildings 1-5 and the Maintenance Building, the soils beneath the asphalt cap, and the South Pond Area. The only areas remaining in OU2 and OU4 which were not impacted by the response actions were shown in the OU4 BRA to have no significant associated risks, so remedial alternatives were not developed for these few areas.

Remediation goals are established to determine the contaminant concentrations in site media that pose a risk to human health and the environment, thereby necessitating implementation of a site remedy. The response actions have reduced risks creating an acceptable risk for industrial use of OU2 and OU4 provided the maintenance activities required by the response actions are conducted. However, health risks are still present for a future site use scenario.

The general remedial action objective for OU2 and OU4 is as follows:

"Maintain the Buildings, asphalt cap, and SPA so that exposure pathways continue to be controlled or minimized. This will minimize risk for both the current and anticipated future industrial use of the site, and will protect human health and the environment."

Specific remedial action objectives corresponding with the nature and extent of contamination at the site and the associated findings of the OU2 and OU4 BRAs, are as follows:

Building-Specific Remedial Action Objective

"To maintain the control of potential exposure pathways related to contaminated materials in Buildings 1 through 5 and the Maintenance Building, and to protect human health and the environment during continued and future industrial uses".

Soil-Specific Remedial Action Objective
"To maintain the control of potential exposure pathways related to contaminated soils and to protect human health and the environment during continued and future industrial uses similar to the current industrial operations and activities."

South Pond Sediment-Specific Remedial Action Objective
"To minimize the risks from potential exposure pathways related to contaminated sediments and to protect human health and the environment during continued and future industrial uses.

The remedial alternatives evaluated in detail in the OU2 and OU4 FS are summarized in this section. Alternatives were developed separately in the FS for the buildings of OU4, the soils beneath the asphalt cap, and the SPA, hereafter referred to as the "focus areas". The descriptions provided here identify engineering and treatment components, institutional controls, implementation requirements, estimated costs, and major applicable or relevant and appropriate requirements (ARARs) associated with each option.

7.1 Buildings 1-5 and the Maintenance Building

At the conclusion of the initial development and evaluation of alternatives in the FS, three alternatives were retained for detailed evaluation: Building Alternative 1 - No Further Action, Building Alternative 2 - Limited Action, and Building Alternative 4 - Source Layer Removal/Disposal.

7.1.1 Building Alternative 1 - No Further Action

Building Alternative 1 would involve no further remedial actions beyond the efforts performed under the building response action. The building response action included cleaning and vacuuming interior surfaces, placing an epoxy coating on the walls and a urethane coating of the floors, repair or replacement of ceiling and wall insulation, and inventory parts washing. The response action also included provisions for maintenance including routine inspections, periodic sampling, and guidelines for damage repair. The No Further Action alternative, required by the National Oil and Hazardous Substances Contingency Plan (NCP) and CERCLA, is a baseline alternative against which the effectiveness of the other alternatives can be compared.

No restrictions on future uses of the site would be implemented under this alternative; therefore, the remedial action objective of maintaining the exclusion of the exposure pathways may not be met by this alternative. No ARARs were identified for this alternative. No reduction of the toxicity or volume of contaminated material would be achieved with this alternative; although, the mobility of the contaminants would be eliminated through the installation and maintenance of the encapsulation materials.

Capital Costs:	$0
Annual O&M Costs:	$31,900 to $53,900
Present Worth:	$597,000
Time to Implement:	0 months

7.1.2 Building Alternative 2 - Limited Action

This alternative would include the same items as Building Alternative 1 with the addition of land use restrictions which would ensure that the epoxy/urethane encapsulation and insulation is not intentionally damaged or removed. The land use restrictions would also prohibit residential development, restricting the site to industrial uses only.

This alternative would meet the remedial action objectives for the buildings. No ARARs were identified for this alternative. No reduction of the toxicity or volume of contaminated material would be achieved with this alternative; although, the mobility of the contaminants would be minimized through the previous installation and continued maintenance of the encapsulation materials. The long-term effectiveness of this alternative would be dependent upon the proper conduct of the required maintenance activities.

Capital Costs:	$5,000
Annual O&M Costs:	$31,900 to $53,900
Present Worth:	$602,000
Time to Implement:	2 months

7.1.3 Building Alternative 4 - Source Layer Removal/Disposal

This alternative would involve decontamination of the buildings by removal of a layer of the concrete floors and removal of the insulation. The decontamination debris would then be disposed of at an offsite Resource Conservation and Recovery Act (RCRA) hazardous waste landfill or a RCRA solid waste landfill based on results of sampling during the implementation of the remedial action.

A layer of the contaminated concrete floor surfaces would be removed by either shallow grit blasting or scarification and the resulting debris would be collected and temporarily stored in roll-off containers. The building insulation and material used to secure the insulation would be removed and also temporarily stored in roll-off containers. The insulation material would then be disposed of at a TSCA landfill. The epoxy coatings that were placed on the walls would be left in place and repaired as necessary.

This alternative would meet the remedial action objectives for the buildings. Minimal residual risks would remain beneath the epoxy coating on the walls of the buildings after the removal of the contaminated concrete and insulation. The ARARs identified for this alternative include several requirements of the Resource Conservation and Recovery Act (RCRA) pertaining to the generation and disposal of hazardous and solid wastes. Specifically, provisions in 40 CFR Parts 261 and 268 are relevant and appropriate for waste analysis and identification of hazardous wastes for materials which are removed from the buildings. In addition, RCRA requirements of 40 CFR Part 262 are relevant and appropriate for the offsite shipment of wastes. The regulations found at 40 CFR Part 761 of the Toxic Substance Control Act (TSCA) are applicable to actions involving the disposal of material containing PCBs. The IDNR has identified the Solid Waste Management and Disposal Rule 567-100.3(2)(455B) and Rule 567-102.15(2)(455B) as ARARs which would allow for the disposal of contaminated materials containing up to 10 mg/kg total pesticides in a sanitary landfill. All identified ARARs would be met by this alternative. Requirements of the Occupational Safety and Health Act (OSHA), the CERCLA Offsite Rule, and Department of Transportation (DOT) regulations are not ARARs, but would be followed during remedial activities.

This alternative would provide long-term effectiveness and permanence by removing contaminated material from the buildings. This alternative would not directly reduce the toxicity or volume of contaminated material; however, the contaminated material would be permanently removed from the buildings and placed in a landfill where the mobility would be reduced.

Capital Costs:	$2,824,600
Annual O&M Costs:	$1,000 to 13,900
Present Worth:	$2,876,000
Time to Implement:	8 months

7.2 Soil Beneath Asphalt Cap

At the conclusion of the initial development and evaluation of alternatives in the FS, three alternatives were selected to be carried forward to detailed evaluation: Soil Alternative 1 - No Further Action, Soil Alternative 2 - Limited Action, and Soil Alternative 4 - Source Removal/ Disposal.

7.2.1 Soil Alternative 1 - No Further Action

Soil Alternative 1 would involve no further remedial actions beyond the efforts performed under the surface cap response action which included placement of an asphalt cap over the majority of the OU2 soils and a large portion of OU4 soils. The response action also included provisions for maintenance including preventive actions, routine inspections, and guidelines for damage repair. The No Further Action alternative, required by the NCP and CERCLA, is a baseline alternative against which the effectiveness of the other alternatives can be compared.

No restrictions on future uses of the site would be implemented under this alternative; therefore, the remedial action objective of maintaining the exclusion of the exposure pathways may not be met. The only ARARs for this alternative are the Executive Order for Wetlands Protection and the Floodplain Management Executive Order. These ARARs would be met because no actions would be taken that would damage the floodplain or wetland area. No reduction of the toxicity or volume of contaminated material would be achieved with this alternative; although, the mobility of the contaminants would be eliminated with the installation of the capping materials.

Capital Costs:	$0
Annual O&M Costs:	$52,600 to $65,500
Present Worth:	$844,000
Time to Implement:	0 months

7.2.2 Soil Alternative 2 - Limited Action

This alternative would provide for enhanced maintenance of the asphalt cap and land use restrictions. An addition to the current maintenance program would include the application of periodic seal coats over the entire surface of the asphalt cap. The land use restrictions would prohibit the removal of the asphalt cap and any activities that might damage the integrity of the cap. It would also prohibit residential development and restrict industries such as human health care and food processing industries from using the site.

This alternative would meet the remedial action objectives for soils provided that the maintenance program is executed as required. The only ARARs for this alternative are the Executive Order for Wetlands Protection and the Floodplain Management Executive Order. These ARARs would be met because no actions would be taken that would damage the floodplain or wetland area. No reduction of the toxicity or volume of contaminated material would be achieved with this alternative; although, the asphalt cap would reduce the mobility of the contaminants both through reduction of infiltration and surface erosion. The long-term effectiveness of this alternative would be dependent upon the willingness of the property owner to conduct the required maintenance activities and the effective enforcement of land-use restrictions.

Capital Costs:	$5,000
Annual O&M Costs:	$86,600 to $99,500
Present Worth:	$1,372,000
Time to Implement:	2 months

7.2.3 Soil Alternative 4 - Source Removal/ Disposal

This alternative would involve the excavation and disposal of contaminated soil and sediments containing concentrations of contaminants that are responsible for cancer risk equal to or greater than $1x10^{-4}$. It is estimated that 5,300 cubic yards of soil would require excavation. The asphalt cap installed during the response action would be removed and soils would be excavated using standard earth moving equipment. Dust suppressants would be used to control dust during excavation and loading activities. The excavated areas would be backfilled with clean soil and the asphalt cap would be restored. Characterization sampling of the excavated materials would be performed to determine whether the material would be disposed of at a RCRA hazardous waste landfill or as a special waste at a RCRA solid waste landfill.

This alternative would meet the remedial action objectives for soils by removing contaminated materials from the site. The ARARs identified for this alternative include the same RCRA requirements and the IDNR ARARs identified for Building Alternative 4. In addition, the requirements of the Executive Order for Wetlands Protection and the Floodplain Management Executive Order would be applicable. This alternative would comply with all ARARs. OSHA requirements, the CERCLA Offsite Rule, and DOT regulations would not be ARARs, but would be followed during remedial activities.

This alternative would provide long-term effectiveness and permanence by removing the contaminated soils from the site. This alternative would not directly reduce the toxicity or volume of contaminated material; however, the contaminated material would be permanently removed from the site and placed in a landfill where the mobility would be reduced.

Capital Costs:	$2,171,800
Annual O&M Costs:	$12,900
Present Worth:	$2,209,000
Time to Implement:	6 months

7.3 South Pond Area

At the conclusion of the initial development and evaluation of alternatives in the FS, three alternatives for remediation of the SPA were selected to be carried forward for detailed evaluation in the FS: Sediment Alternative 1 - No Further Action, Sediment Alternative 2 - Limited Action, and Sediment Alternative 4 - Source Removal/Disposal.

7.3.1 Sediment Alternative 1 - No Further Action

Sediment Alternative 1 would involve no further remedial actions beyond the efforts performed under the SPA response action which includes excavation and offsite disposal of soils around the SPA, east drainage ditch, and stockpiled soil piles. The response action also includes provisions for monitoring the outfall of the SPA to ensure that any contaminated sediments remaining at the bottom of the pond do not wash out of the pond and recontaminate the east drainage ditch. Monitoring would be conducted annually for three years following completion of excavation activities. The No Further Action alternative, required by the NCP and CERCLA, is a baseline alternative against which the effectiveness of the other alternatives can be compared.

No restrictions on future uses of the site would be implemented under this alternative; therefore, the remedy may not be protective of human health or the environment since the health-based cleanup levels established in the action memorandum are based upon an industrial use of the area. More protective cleanup levels would be necessary for a residential setting. The only ARARs for this alternative are the Executive Order for Wetlands Protection and the Floodplain Management Executive Order. These ARARs would be met because no actions would be taken that would damage the floodplain or wetland area. No reduction of the toxicity or volume of contaminated material would be achieved with this alternative.

Capital Costs:	$0
Annual O&M Costs:	$14,800 to $27,700
Present Worth:	$263,000
Time to Implement:	0 months

7.3.2 Sediment Alternative 2 - Limited Action

This alternative consists of land use restrictions and continued soil monitoring of the South Pond outfall during the required CERCLA periodic reviews. The land use restrictions would prohibit residential development to prevent disturbance of any contaminated sediments remaining in the pond, and would ensure the protectiveness of the SPA response action cleanup levels. Periodic soil sampling at the outfall of the pond would confirm whether contaminated sediments in the bottom of the pond remain in the pond. If sampling shows that contaminated sediments are being washed out of the pond, further action may be required.

This alternative would meet the remedial action objectives for soils. The only ARARs for this alternative are the Executive Order for Wetlands Protection and the Floodplain Management Executive Order. These ARARs would be met because no actions would be taken that would damage the floodplain or wetland area. No reduction of the toxicity, volume, or mobility would be achieved beyond the reduction of contaminant mobility achieved by the SPA response action. The long-term effectiveness of this alternative would be dependent upon the effective enforcement of land-use restrictions.

Capital Costs:	$5,000
Annual O&M Costs:	$14,800 to $28,900
Present Worth:	$268,000
Time to Implement:	2 months

7.3.3 Sediment Alternative 4 - Source Removal/ Disposal

This alternative would involve the excavation and offsite disposal of contaminated sediments remaining in the SPA following the SPA response action. Sediments containing concentrations of contaminants that are responsible for cancer risk equal to or greater than $1x10^{-4}$ would be excavated and transported offsite for disposal at an EPA-approved facility. It is estimated that 1,000 cubic yards of sediment would require excavation. Dust suppressants would be used to control dust during excavation and loading activities. The excavated areas would be backfilled with clean soil and revegetated as necessary to restore natural conditions around the pond. Characterization sampling of the excavated materials would be performed to determine whether the material would be disposed of at a RCRA hazardous waste landfill or as a special waste at a RCRA solid waste landfill. Land-use restrictions would also be included in this alternative.

This alternative would meet the remedial action objectives for sediments by removing contaminated materials from the site. ARARs identified for this alternative include the same RCRA requirements and IDNR

ARARs identified for Building Alternative 4 and Soil Alternative 4 for waste analysis, identification of hazardous wastes, and offsite shipping and disposal of waste. In addition, the requirements of the Executive Order for Wetlands Protection and the Floodplain Management Executive Order would be applicable. This alternative would comply with all ARARs. OSHA requirements, the CERCLA Offsite Rule, and DOT regulations would not be ARARs, but would be followed during remedial activities.

This alternative would provide long-term effectiveness and permanence by removing the contaminated sediments from the site. This alternative would not directly reduce the toxicity or volume of contaminated material; however, the contaminated material would be permanently removed from the site and placed in a landfill where the mobility would be reduced.

Capital Costs:	$270,300
Annual O&M Costs:	$12,900
Present Worth:	$273,000
Time to Implement:	4 months

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives presented above were evaluated in the FS with respect to the nine criteria required by the NCP for the evaluation of remedial alternatives. This section discusses the performance of the preferred alternatives against the following nine evaluation criteria:

- Overall Protection of Human Health and the Environment - This criterion addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs - Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting laws that specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide basis for a waiver from any of these laws.

- Long-term Effectiveness and Permanence - This criterion evaluates the ability of a remedy to maintain reliable protection of human health and the environment over time. The criterion includes the consideration of residual risk and the adequacy and reliability of controls.

- Reduction of Toxicity, Mobility, or Volume Through Treatment - This criterion evaluates the preference for a remedy that employs treatment technologies that reduce health hazards, contaminant migration, or the quantity of contaminants at a site.

- Short-term Effectiveness - Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.

- Implementability - This criterion evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the remedy. It also includes coordination of Federal, State, and local governments which may be necessary to implement a remedy.

- Cost - This criterion examines the estimated costs for each remedial alternative. For comparison, capital and annual O&M costs are used to calculate a present worth cost for each alternative.

- State Acceptance - This criterion assesses the position of the state regulatory agency regarding the remedial alternatives preferred by EPA.

- Community Acceptance - This criterion considers the level of community support for EPA's preferred alternatives by reviewing public comments received during the public comment period or at the public meeting.

These nine evaluation criteria have been developed by EPA to address the CERCLA statutory requirements and technical, cost, and institutional considerations which the EPA has determined appropriate. The evaluation criteria serve as the basis for conducting the detailed analysis during the FS and for subsequently selecting an appropriate remedy.

The first two criteria are threshold criteria. These criteria must be met for an alternative to be considered a remedy for a site. The next five criteria are balancing criteria. Tradeoffs are made among the alternatives with respect to these criteria. The last two criteria are modifying criteria and are used to modify the preferred alternative as appropriate following the public comment period.

8.1 Comparative Analysis of Building Alternatives

8.1.1 Overall Protection of Human Health and the Environment

All of the building alternatives would provide protection of human health and the environment for continued industrial uses of the property. The limited action alternative, Building Alternative 2, would meet the remedial action objective for the buildings by maintaining the control of the exposure pathways through implementation of land use restrictions and continued maintenance of the building encapsulation materials. Building Alternative 4 would also provide protection of human health and the environment because the contaminated materials would be permanently removed from the buildings. Building Alternative 1 would not meet the remedial action objective because it would not provide for future use restrictions.

8.1.2 Compliance with ARARs

There are no ARARs associated with Building Alternatives 1 and 2. Building Alternative 4 would comply with the ARARs identified in Section 7.1.3 pertaining to waste analysis, identification of hazardous wastes, and offsite shippping and disposal of waste. While OSHA is not an ARAR, OSHA requirements for worker health and safety would be followed for all of the remedial alternatives.

8.1.3 Long-Term Effectiveness and Permanence

Building Alternative 2 would provide long-term effectiveness by ensuring the integrity of the building encapsulation materials through the implementation of land use restrictions and continued maintenance. Building Alternative 1 would not provide long-term effectiveness because no provisions for restricting the uses of the buildings or removal of the encapsulation materials would be provided. Building Alternative 4 would eliminate

the long-term residual risks by removing the contaminated concrete surfaces and insulation materials. None of the alternatives would provide a truly permanent solution because residual risks would remain. Of the alternatives, alternative 4 would provide more permanence because it would remove at least some of the contaminated material from the site.

8.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the developed alternatives would involve methods to treat the contaminants that would reduce the toxicity or volume of the wastes. Building Alternative 2, through site use restrictions, would prevent removal of the encapsulation material which would eliminate the mobility of the contaminants. Building Alternative 1 would eliminate the mobility of the contaminants, but would not provide for long-term measures to ensure the immobility is maintained. Building Alternative 4 would remove contaminated materials from the buildings and place them in a RCRA landfill or TSCA landfill as appropriate, which would ultimately reduce the mobility of the contaminants.

8.1.5 Short-term Effectiveness

Building Alternatives 1 and 2 would require practically no time to implement, with no adverse impact to site workers or area residents. Building Alternative 4 would require approximately 8 months to implement. Building Alternative 4 would also present higher short-term risks of exposure to the community and workers during the concrete surface and insulation removal efforts and transportation.

8.1.6 Implementability

Building Alternatives 1 and 2 would be easily implemented. The land use restrictions under Building Alternative 2 could be easily added to the property deed with coordination between EPA and the city. Building Alternative 4 would involve the use of readily available equipment and resources.

8.1.7 Cost

The present worth cost of Building Alternative 1 is estimated at $597,000. The present worth cost of Building Alternative 2 is estimated to be $602,000, and the present worth cost of Building Alternative 4 is $2,876,000.

8.1.8 State Acceptance

The Iowa Department of Natural Resources (IDNR) has provided oversight assistance to EPA throughout the history of the Des Moines TCE site. The IDNR participated in the public meeting in support of EPA's preferred alternative.

8.1.9 Community Acceptance

To a large extent, the community is supportive of the limited action alternative. However, the Iowa Environmental Council requested EPA to consider the source removal alternative. EPA's response to their request is included in the Responsiveness Summary.

8.2 Comparative Analysis of the Soil Alternatives

8.2.1 Overall Protection of Human Health and the Environment

All of the soil alternatives would provide protection of human health and the environment for continued industrial site uses, but not for residential use. Soil Alternative 2 would meet the remedial action objective for the soils by maintaining control of the exposure pathways through implementation of land use restrictions and enhanced maintenance of the asphalt cap. Soil Alternative 4 would also provide a high degree of protectiveness by removing contaminated soils from the site. Soil Alternative 1 would not meet the remedial action objective because it would not provide for future land use restrictions to prevent residential development.

8.2.2 Compliance with ARARs

ARARs identified for the soil alternatives were presented in Section 7.2.3 above. Soil Alternatives 1 and 2 would comply with ARARs regarding the protection of floodplains and wetlands because no actions would be taken that would damage the floodplain or wetland area. Soil Alternative 4 would comply with ARARs pertaining to waste analysis, identification of hazardous wastes, and offsite shipping and disposal of waste. While OSHA is not an ARAR, OSHA requirements for worker health and safety would be followed for all of the remedial alternatives.

8.2.3 Long-Term Effectiveness and Permanence

Soil Alternative 2 would provide long-term effectiveness by ensuring maintenance of the cap and restricting future site uses, but would not provide permanence as residual risks would remain beneath the cap. Soil Alternative 1 would not provide long-term effectiveness or permanence because no provisions for restricting future uses of the site or removal of the cap would be provided and residual risks would remain beneath the cap. Soil Alternative 4 would provide both long-term effectiveness and permanence through the elimination of the long-term residual risks at the site by removing the contaminated soils posing risks greater than $1x10^{-4}$.

8.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the developed alternatives would involve methods to treat the contaminants that would reduce the toxicity or volume of the wastes. Soil Alternative 2 would reduce the mobility of the contaminants by reducing wind and surface erosion. Soil Alternative 1 would reduce the mobility of the contaminants, but would not provide for long-term measures to ensure the immobility is maintained. Soil Alternative 4 would remove the contaminated soils from the site and place them in a RCRA landfill, which would ultimately reduce the mobility of the contaminants.

8.2.5 Short-term Effectiveness

Soil Alternatives 1 and 2 would require practically no time to implement. Soil Alternative 4 would require approximately 6 months to implement. In addition, Soil Alternative 4 would present higher short-term risks of exposure to the community and workers during the soil excavation efforts and transportation.

8.2.6 Implementability

Soil Alternatives 1 and 2 would be easily implemented. The land use restrictions under Soil Alternative 2 could be easily added to the property deed, but would require coordination between EPA and the city. Soil Alternative 4 would involve the use of readily available equipment and resources.

8.2.7 Cost

The present worth cost of Soil Alternative 1 is estimated at $844,000. The present worth cost of Soil Alternative 2 is estimated to be $1,372,000, and the present worth cost of Soil Alternative 4 is $2,209,000.

8.2.8 State Acceptance

The Iowa Department of Natural Resources (IDNR) has provided oversight assistance to EPA throughout the history of the Des Moines TCE site. The IDNR participated in the public meeting in support of EPA's preferred alternative.

8.2.9 Community Acceptance

To a large extent, the community is supportive of the limited action alternative. However, the Iowa Environmental Council requested EPA to consider the source removal alternative. EPA's response to their request is included in the Responsiveness Summary.

8.3 Comparative Analysis of the Sediment Alternatives

8.3.1 Overall Protection of Human Health and the Environment

Sediment Alternative 2 meets this criterion and would meet the remedial action objective for the sediments through the implementation of land use restrictions to prevent residential development. Sediment Alternative 4 would also provide a high degree of protectiveness by removing contaminated sediments from the site. Sediment Alternative 1 would not meet the remedial action objective because it would not provide for future land use restrictions.

8.3.2 Compliance with ARARs

Sediment Alternatives 1 and 2 would comply with ARARs as identified in Section 7.3.3 regarding the protection of floodplains and wetlands because no actions would be taken that would damage the floodplain or wetland area. Sediment Alternative 4 would comply with ARARs pertaining to waste analysis, identification of hazardous wastes, and offsite shipping and disposal of waste. While OSHA is not an ARAR, OSHA requirements for worker health and safety would be met for all remedial alternatives.

8.3.3 Long-Term Effectiveness and Permanence

Sediment Alternative 2 would provide long-term effectiveness by conducting soil monitoring of the outfall of the South Pond and restricting future site uses, but would not provide permanence as residual risks would remain in the bottom of the pond. Sediment Alternative 1 would not provide long-term effectiveness or permanence because no provisions for restricting future uses of the site would be provided and residual risks would remain in the pond. Sediment Alternative 4 would provide both long-term effectiveness and permanence through the elimination of the long-term residual risks at the site by removing the contaminated sediments posing risks greater than $1x10^{-4}$.

8.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the developed alternatives would involve methods to treat the contaminants that would reduce the toxicity, volume, or mobility of the wastes. However, Sediment Alternative 2 would reduce the mobility of

the contaminants by ensuring the contaminated sediments remain in the pond and do not wash out into the east drainage ditch. Sediment Alternative 1 would reduce the mobility of the contaminants in the short term (three years), but would not provide for long-term measures to ensure the immobility is maintained. Sediment Alternative 4 would remove the contaminated sediments from the site and place them in a RCRA landfill, which would ultimately reduce the mobility of the contaminants.

8.3.5 Short-term Effectiveness

Sediment Alternatives 1 and 2 would require practically no time to implement. Sediment Alternative 4 would require approximately 6 months to implement. In addition, Sediment Alternative 4 would present higher short-term risks of exposure to the community and workers during the sediment excavation efforts and transportation.

8.3.6 Implementability

Sediment Alternatives 1 and 2 would be easily implemented. The land use restrictions under Sediment Alternative 2 could be easily added to the property deed with coordination between EPA and the city. Sediment Alternative 4 would involve the use of readily available equipment and resources.

8.3.7 Cost

The present worth cost of Sediment Alternative 1 is estimated at $263,000. The present worth cost of Sediment Alternative 2 is estimated to be $268,000, and the present worth cost of Sediment Alternative 4 is $273,000.

8.3.8 State Acceptance

The Iowa Department of Natural Resources (IDNR) has provided oversight assistance to EPA throughout the history of the Des Moines TCE site. The IDNR participated in the public meeting in support of EPA's preferred alternative.

8.3.9 Community Acceptance

To a large extent, the community is supportive of the limited action alternative. However, the Iowa Environmental Council requested EPA to consider the source removal alternative. EPA's response to their request is included in the Responsiveness Summary.

9.0 THE SELECTED REMEDY

Based on the evaluation of the relative performance of each alternative with respect to the nine evaluation criteria, EPA has determined that the limited action alternatives, Building Alternative 2, Soil Alternative 2, and Sediment Alternative 2 present the best balance of tradeoffs among the alternatives considered for cleanup of OU2 and OU4 at the Des Moines TCE site. The selected remedies include placement of land use restrictions on the property and maintenance programs designed to maintain the risk reduction achieved during the three response actions. Because waste remains at the site, EPA will conduct a review of the remedies at least once every five years as required by CERCLA.

EPA believes the limited action alternatives satisfy the statutory requirements in CERCLA Section 121 for the protection of human health and the environment; compliance with federal and state requirements that are legally applicable or relevant and appropriate, and cost-effectiveness.

The main components of the selected remedies include:

- Continued maintenance as called for by the response actions;
- Land use restrictions to prevent residential development;
- Periodic seal coats applied to the asphalt cap; and
- Sampling of soils at the South Pond discharge area during CERCLA periodic reviews.

Each of the three response actions served to reduce the risks to human health and the environment through either the removal of contaminants from the site or by controlling the exposure pathways. In the case of Buildings 1-5 and the Maintenance Building, cleanup levels were developed for inhalation (air) exposures and incidental ingestion and dermal contact soil exposures. These risk-based cleanup levels are presented on Table 9-1 below.

Following the building response action, air monitoring was conducted to determine compliance with the cleanup levels. At that time, cleanup levels were not achieved in all of the buildings. EPA requested the Agency for Toxic Substances and Disease Registry (ATSDR) to provide a consultation regarding the protectiveness of the contaminant levels remaining in the buildings. ATSDR concluded that the contaminant levels remaining in the buildings were within EPA's acceptable carcinogenic risk range of $1x10^{-4}$ to $1x10^{-6}$ for occupational workers. ATSDR also recommended that the buildings be routinely ventilated and that air monitoring be periodically conducted. EPA notified Dico of ATSDR's recommendations and requested Dico to revise the Building O&M Plan to include routine house cleaning measures and ventilation, and the air monitoring. To date, Dico has not made the requested revisions to the O&M plan. EPA agrees that the contaminant levels achieved by the removal actions in the buildings do not present a significant health threat for site workers. Further, EPA believes that reasonable measures have been taken to clean the building surfaces, and would approve the use of these buildings for industrial uses. However, the minor additions to the O&M Plan mentioned above would serve to further reduce the potential risks to site workers.

For the soils beneath the asphalt cap, risk-based cleanup levels were developed for aldrin, dieldrin, and lead, as these were the main contaminants found above levels of concern. The risk assessments revealed that a combined aldrin/dieldrin concentration of 1.5 mg/kg yielded a residual cancer risk of $1x10^{-4}$. EPA generally considers a lead concentration of 1,000 mg/kg to be protective for an industrial setting. ATSDR was consulted and agreed that these levels would be protective for an industrial setting. For the soils response action, EPA provided for either the excavation and disposal of soils in OU2 and OU4 containing aldrin, dieldrin, and lead above these risk-based cleanup levels or capping of the soils in place. Dico chose the capping alternative. Therefore, residual risks greater than $1x10^{-4}$ remain at the site, but the exposure pathway has been controlled by the placement of the asphalt cap. EPA believes the capping action to be protective of human health and the environment provided the cap is properly maintained, and the site remains an industrial setting.

Table 9-1
Building Removal Action Cleanup Levels

	Soil	Air
aldrin	1.5 mg/kg	$1x10^{-6}$ mg/m^3
dieldrin		$1x10^{-6}$ mg/m^3
heptachlor	Note 1	$3x10^{-6}$ mg/m^3
chlordane	18 mg/kg	$1x10^{-5}$ mg/m^3
2,4-D	Note 1	$5x10^{-3}$ mg/m^3
2,4,5-T	Note 1	$5x10^{-3}$ mg/m^3
2,3,7,8-TCDD	Note 1	$1x10^{-10}$ mg/m^3

Notes:
1. Cleanup levels for these constituents were not developed because these constituents were not found in soils around the subject buildings above a level that presented an unacceptable risk for an industrial use setting.

For the soils and sediments in the South Pond Area, risk-based cleanup levels were developed for the primary contaminants of concern; aldrin, dieldrin, and chlordane. Levels which represent a $1x10^{-4}$ risk include a combined aldrin/dieldrin concentration of 1.5 mg/kg and a chlordane concentration of 18.0 mg/kg. The South Pond Area response action calls for excavation and offsite disposal of soils and sediments containing aldrin, dieldrin, and chlordane above these risk-based levels. As mentioned above, these risk-based levels are based upon an industrial setting, and would not be protective for a residential setting. For this reason, the land use restrictions called for by the selected remedies are essential to ensure protection of human health and the environment.

Detailed cost estimates were prepared during the FS and are summarized here in Table 9-2. A significant portion of the cost of the selected remedies is the cost of O&M. These costs reflect the level of effort involved in conducting the monthly and annual inspections and preparing the inspection reports. The present worth costs reflect a thirty year life of the remedy.

TABLE 9-2 Cost Summary for the Selected Remedies	
	Estimated Cost
Building Alternative 2 :	
Capital costs	$5,000
Average annual O&M costs	$41,240
Present Worth	$602,000
Soil Alternative 2 :	
Capital costs	$5,000
Average annual O&M costs	$93,050
Present Worth	$1,372,000
Sediment Alternative 2 :	
Capital costs	$5,000
Average annual O&M costs	$21,850
Present Worth	$272,000
Total OU2/OU4 Remedy :	
Capital costs	**$15,000**
Average annual O&M costs	**$156,140**
Present Worth	**$2,246,000**

10.0 STATUTORY DETERMINATIONS

EPA's selected remedial actions for CERCLA sites must meet several requirements set forth in Section 121 of CERCLA. These requirements include the following:

- Be protective of human health and the environment;
- Comply with ARARs or justify an ARAR waiver;
- Be cost-effective;
- Utilize permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable; and
- Satisfy the preference for treatment that reduces the toxicity, mobility, or volume as a principal element, OR provide an explanation as to why this preference is not satisfied.

The sections below discuss how the selected remedies meet the statutory requirements.

10.1 Protection of Human Health and the Environment

The three response actions conducted in OU2 and OU4 provided a high degree of protectiveness by removing contaminated material from the site or by controlling the exposure pathways. The selected remedial actions will enhance the protection of human health and the environment achieved during the response actions by maintaining control of the exposure pathways and restricting land use to industrial activities. EPA recognizes that the selected remedy would not provide for the protection of human health and the environment if the site were to be developed as residential property. In the event that the site is developed for a residential setting, further remedial action will be considered by EPA.

10.2 Compliance with ARARs

The actions included in the selected remedy will comply with all identified ARARs. For the Building Alternative 2, no ARARs were identified. For the Soil Alternative 2 and Sediment Alternative 2, applicable requirements include the Executive Order on Protection of Wetlands and the Floodplain Management Executive Order. In addition, the OSWER guidance on Considering Wetlands at Superfund Sites is a TBC. The selected remedial alternatives would comply with these requirements because no action would be taken that would damage the wetland or floodplain.

10.3 Cost Effectiveness

EPA believes that the selected remedy provides the highest degree of protectiveness in proportion with its estimated cost. The no action alternatives, including continued maintenance of the response actions, are almost as costly as the selected alternatives, but do not provide adequate protection of human health and the environment.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable.

The selected remedy utilizes permanent solutions to the maximum extent practicable. Cleanup actions already performed as part of the OU4 removal actions removed the soils most highly contaminated with pesticides and herbicides for off-site disposal. EPA evaluated alternatives involving excavation and offsite disposal of additional pesticide and herbicide contaminated soils, but found those alternatives did not provide an appreciably higher degree of protectiveness than the capping alternative so long as the cap is properly maintained. Given the

risk reduction achieved by the response actions, the extent of response considered to be practicable is limited to maintenance of the response actions and land use restrictions to prevent residential development. An alternative treatment technology, in-situ vapor stripping, was evaluated in a treatability study for potential application to the VOC contamination in OU2. The study was conducted prior to the placement of the asphalt cap and concluded that vapor stripping is not an effective treatment option for the OU2 soils.

10.5 Preference for Treatment as a Principal Element

The selected remedy does not meet this preference. As discussed above, the response actions have reduced risks posed by OU2 and OU4, and provide for the protection of human health and the environment for an industrial setting, provided the response actions are properly maintained. The selected remedy provides for the necessary maintenance activities as well as land use restrictions to maintain industrial use of the property. Remedial actions involving treatment as a principal element were evaluated in the early stages of the FS, but were not carried forward for detailed evaluation because such alternatives did not provide an appreciably higher degree of protectiveness, and were not cost effective.

RESPONSIVENESS SUMMARY

Des Moines TCE Site
Operable Units 2 and 4

The purpose of the responsiveness summary is to provide EPA's response to comments received on the proposed plan during the public comment period. The public comment period on the preferred remedial alternatives began June 3, 1996 and ended July 5, 1996. A public meeting was held in Des Moines, Iowa on June 11, 1996 at the Des Moines City Library. All questions and comments received during the public meeting were addressed at the meeting.

Written comments were received during the public comment period from the Iowa Environmental Council and the Dichem Customer Group. Copies of the comment letters are included in the administrative record. The discussion below provides a summary of each comment received followed by EPA's response.

Iowa Environmental Council

Comment: **What is the rationale for the thirty year maintenance period of the proposed remedy considering the concentrations of the contaminants at the site and their persistence in the environment?**

Response: The thirty year maintenance period is used for calculating the present worth cost of the remedial alternatives, and does not necessarily represent the actual duration of the remedy. EPA guidance suggests that when calulating the present worth cost of alternatives, the period of performance should not exceed thirty years. Maintenance activities to ensure the integrity of the previous response actions at the site could continue beyond thirty years to ensure continued protection of the public health and the environment.

Comment: **How are the recommended maintenance actions justified considering the persistence of the contaminants, the location of the site in the center of Des Moines, and the close proximity of the site to the water treatment plant serving the metropolitan area?**

Response: In the consideration of remedial alternatives, EPA must consider several factors including, but not limited to, protectiveness of human health and the environment, implementability, and cost. EPA agrees that the contaminants present at the site are persistent in the environment, but the previous response actions served to eliminate the exposure pathways. EPA believes that the control of exposure pathways will be an effective way to protect human health and the environment provided that certain maintenance activities are conducted. EPA has considered alternatives calling for removal of contaminated soils and building materials. While these alternatives provide an advantage in terms of a more permanent solution, they were not selected due to high cost and implementability concerns.

The site is located in an industrial area south of downtown Des Moines, and is bordered to the west and south by the Raccoon River. Given that the city plans to maintain an industrial zoning for the Dico property, and the remedy includes land-use restrictions, the maintenance alternative with periodic reviews by EPA is considered an appropriate remedial approach.

Regarding the close proximity of the site to the Des Moines Water Works, a groundwater extraction and treatment system has been operating successfully for several years and prevents contaminated groundwater

from entering the city's water supply source. In addition, the pesticides remaining in the site soils, while being persistent in the environment, have a tendency to adhere to soil and do not readily migrate into the groundwater. Further, the placement of the asphalt cap prevents groundwater infiltration from occurring. The presence of aldrin, dieldrin, and chlordane in the soils of OU2 and OU4 do not present a threat to the groundwater in the area.

Comment: **Are the seals on the walls and floors of the buildings going to be maintained forever? Does the maintenance option adequately protect the public from exposure to PCBs in case of a fire in the buildings?**

Response: The limited action alternative calls for maintenance of the coatings applied to the walls and floors of the Dico buildings for as long as the contaminants remain above health-based levels. The maintenance plan calls for periodic inspection and repairs as necessary under normal operating conditions. Any time the integrity of the encapsulation actions is compromised, repairs will be required to prevent exposure.

Comment: **The asphalt cap must remain in place to prevent exposure and must be maintained for more than thirty years to protect public health. The maintenance of the cap will prevent development of the site for public use and will preclude any development activity requiring excavation of site soils.**

Response: EPA agrees that the cap must remain in place and be properly maintained to provide the necessary protection of public health and the environment. Maintenance activities will continue as appropriate to assure protection of public health and the environment, and could continue beyond thirty years. The presence of contaminants remaining at the site necessitates land-use restrictions to prevent development of the site for public uses. EPA anticipates that the site will continue to be used for industrial purposes. Activities requiring excavation could be allowed with careful coordination regarding the area of excavation and any applicable disposal requirements.

Comment: **The recommended alternative calls for monitoring of the South Pond outfall, but does not assure that contaminated sediments in the pond will not wash out of the pond during a high rain fall event.**

Response: The purpose of sampling at the outfall of the pond is to determine whether contaminated sediments have washed out of the pond and recontaminated the east drainage ditch. EPA does not expect recontamination to occur under ordinary conditions, but recognizes that recontamination could occur as a result of an exceptionally high rainfall. If the ditch becomes recontaminated, additional response actions will be considered as appropriate.

Comment: **Land use restrictions could have a significant economic impact on the future growth and development of the city of Des Moines. Given the impact on the city, the cost differential between the cap maintenance and soil removal alternatives is not that great.**

Response: Over the past few years, EPA has closely coordinated its efforts and response actions at the site with the city. In addition, EPA has discussed the future use of the Dico property with the city to assure that future uses of the property do not adversely impact the city. In 1989, as part of the city's Riverpoint Urban Renewal Plan, a portion of the site was designated as high density residential. However, the city council approved an amendment in January 1995 which revised the classification to industrial. The city did not indicate to EPA concern about economic impact due to this revision.

A comparison of the cost differential between the cap maintenance and soil removal alternatives and the economic impact on the city cannot be made because the economic impact on the city is unknown. One could claim that restricting the property to industrial use carries a higher potential for jobs which would have a positive economic impact on the city. The higher cost of the soil removal alternative can not currently be justified given that the most reasonably anticipated land use for this site is industrial.

Comment: **The acute toxicity of chlordane is increased in the presence of aldrin and dieldrin.**

Response: EPA's current risk assessment methodology does not account for synergistic effects or antagonistic effects (the decreased toxicity in the presence of other compounds). Rather, EPA considers the effects of multiple contaminants to be additive, which is a conservative approach.

Comment: **Reconsider the cost effectiveness of the source removal alternatives in light of the persistence of the contaminants and the risk of exposure to the public associated with the maintenance alternatives.**

Response: EPA does not believe the additional cost of the source removal alternatives is justified given the most reasonably anticipated future land use is industrial. For an industrial exposure scenario, the previous response actions have either reduced the health risks to within EPA's acceptable range or have effectively eliminated the exposure pathway. For a site which is most likely to remain industrial, EPA can not justify additional remedial measures beyond the maintenance of the existing actions. EPA agrees that the effectiveness of the remedy in protecting public health is dependent upon the success of the maintenance program. If proper maintenance is not conducted, EPA will reconsider remedial alternatives. In addition, EPA is required to conduct reviews at least every five years whenever contaminants remain at a site. During these reviews, EPA will assess the effectiveness of the maintenance programs and the protectiveness of the remedy. If EPA finds that the remedy is not adequately protecting public health and the environment, additional response actions will be considered.

Dichem Customer Group

Comment: **What is the basis of the thirty year period of operation of the proposed remedy?**

Response: The thiry year period is used for calculating the present worth cost of the remedial alternatives, and does not necessarily represent the actual duration of the remedy. Maintenance activities to ensure the integrity of the previous response actions at the site could continue beyond thirty years.

Comment: **Long term monitoring of the sediments at the South Pond outfall is not necessary.**

Response: Some degree of long term monitoring is required by CERCLA for actions which involve contaminants remaining at the site. For such actions, the NCP requires EPA to conduct a review of the adequacy of the remedy in protecting public health and the environment. These reviews are conducted at least every five years. EPA has revised the selected remedy to include sampling at the South Pond outfall during the periodic reviews instead of annual sampling included in the proposed plan.

TABLE 2-16

FINAL CONSTITUENTS OF INTEREST IN SITE MEDIA
SOUTH AREA SOURCE CONTROL SITE
DES MOINES, IOWA

Constituent	Surficial Soils	Shallow Auger Borings	Deep Auger Borings	Sediment	Groundwater	Surface Water
*Acetone		X[a]	X	X		
Aldrin	X	X	X	X		X
Arsenic				X	X	
Barium				X	X	
Beryllium				X	X	X
Cadmium			X	X		
Chlordane (alpha and gamma)[b]			X			
*Chromium (III)[c]	X		X	X	X	
Chromium (VI)[c]	X		X	X	X	
*Copper	X		X	X	X	X
*4,4'-DDD	X	X	X			
1,2-Dichloroethene (cis)[d]		X	X		X	
1,2-Dichloroethene (trans)[d]		X	X		X	
Dieldrin	X	X	X	X		
Heptachlor			X			
*Lead (inorganic)	X		X	X	X	
Manganese	X		X	X	X	
Nickel				X	X	
*Tetrachloroethene		X	X			
*Toluene		X	X			
Trichloroethene		X	X		X	
Vanadium				X	X	
Vinyl Chloride		X	X		X	
*Xylenes (total)		X	X			
Zinc	X		X	X	X	

[a]An "X" indicates that the parameter has been retained as a constituent of interest in the specified media.
[b]Toxicity values for alpha and gamma chlordane were not available in IRIS or HEAST; therefore the generic constituent of interest is chlordane.
[c]Parameter measured only as chromium. A range of risks will be determined to include both isomers.
[d]Parameter measured as 1,2-dichloroethene (total). A range of risks will be determined to include both isomers.
*Indicates constituents added after concentration-toxicity screen based upon previous use at site and prevalence in site media.

Appendix B

Constituents of Interest Buildings 1-5 and the Maintenance Building
Aldrin
Dieldrin
Endrin ketone
4,4-DDD
4,4-DDT
2,4-D
2,4,5-T
Heptachlor
Chlordane
2,3,7,8-TCDD
PCBs

Appendix C

South Pond Area Data With Exposure Point Concentrations For Current and Future Exposures Focused OU4 Risk Assessment

Location	Surface Soil
Depth	SS101-110
Analyte (all in PPM)	
Pesticides	
delta-BHC	0.00125
4,4'-DDD	0.0048
4,4'-DDE	0.0073
4,4'-DDT	0.0029
Aldrin	0.0087
alpha-Chlordane	0.11
gamma-Chlordane	0.1
Dieldrin	0.64
Endosulfan sulfate	0.00245
Endosulfan II	0.00245
Endrin	0.00245
Endrin ketone	0.0021
Heptachlor	0.00059
Heptachlor epoxide	0.0027
Dioxins	
2,3,7,8-TCDD	0.000049
Inorganics	
Arsenic	
Barium	
Berryllium	
Cadmium	
Chromium	
Cobalt	
Copper	
Cyanide	
Lead	
Magnesium	
Manganese	
Mercury	
Nickel	
Selenium	
Vanadium	
Zinc	

N	Mean	95% UCL	Maximum Concent-ration	Exposure Point Concent-ration
40	1.26E+00	2.94E+00	4.00E+01	2.94E+00
40	2.43E+00	5.59E+00	7.50E+01	5.59E+00
40	2.33E+00	5.48E+00	7.50E+01	5.48E+00
40	2.43E+00	5.59E+00	7.50E+01	5.59E+00
40	3.81E+01	8.21E+01	8.20E+02	8.21E+01
40	2.47E+00	4.21E+00	4.00E+01	4.21E+00
40	3.72E+00	7.08E+00	8.00E+01	7.08E+00
40	9.89E+00	1.62E+01	1.10E+02	1.62E+01
40	2.32E+00	5.48E+00	7.50E+01	5.48E+00
20	1.84E-01	3.78E-01	2.25E+00	3.78E-01
20	1.80E-01	3.74E-01	2.25E+00	3.74E-01
40	2.29E+00	5.45E+00	7.50E+01	5.45E+00
40	1.23E+00	2.91E+00	4.00E+01	2.91E+00
40	1.24E+00	2.92E+00	4.00E+01	2.92E+00
20	5.91E-05	8.26E-05	2.80E-04	8.26E-05
5	7.18E+00		9.40E+00	9.40E+00
5	1.97E+02		3.32E+02	3.32E+02
5	1.01E+00		1.70E+00	1.70E+00
5	2.04E+00		3.30E+00	3.30E+00
5	7.84E+01		1.57E+02	1.57E+02
5	1.07E+01		1.48E+01	1.48E+01
5	5.67E+01		7.84E+01	7.84E+01
5	4.16E-01		9.90E-01	9.90E-01
5	6.28E+02		1.58E+03	1.58E+03
5	6.48E+03		8.12E+03	8.12E+03
5	6.52E+02		8.82E+02	8.82E+02
5	2.36E-01		5.00E-01	5.00E-01
5	3.02E+01		4.30E+01	4.30E+01
5	1.33E+00		2.00E+00	2.00E+00
5	4.03E+01		7.21E+01	7.21E+01
5	4.30E+02		7.28E+02	7.28E+02

File: DICODA03.WK3

Appendix D

Capped OU4 Data With Exposure Point Concentrations For Current and Future Exposures OU4 Risk Assessment

Location Depth	N	Mean	95% UCL	Maximum Concentration	Exposure Point Concentration
Analyte (all in PPM)					
Volatiles					
1,1,1-Trichloroethene	47	1.21E-01	3.18E-01	5.50E+00	3.18E-01
1,2-Dichloroethene	47	1.23E-01	3.20E-01	5.50E+00	3.20E-01
2-Butanone	52	2.26E-01	5.65E-01	1.05E+01	5.65E-01
Acetone	52	3.81E-01	7.20E-01	1.05E+01	7.20E-01
Carbon Disulfide	52	1.10E-01	2.86E-01	5.50E+00	2.86E-01
Ethylbenzene	47	1.32E+00	3.54E+00	6.20E+01	3.54E+00
Methylene Chloride	52	1.36E-01	3.49E-01	6.60E+00	3.49E-01
Tetrachloroethene	47	1.21E-01	3.18E-01	5.50E+00	3.18E-01
Toluene	47	1.32E+00	3.54E+00	6.20E+01	3.54E+00
Trichloroethene	47	1.21E-01	3.18E-01	5.50E+00	3.18E-01
Vinyl Chloride	47	2.31E-01	6.07E-01	1.05E+01	6.07E-01
Xylenes	47	1.24E+01	3.31E+01	5.80E+02	3.31E+01
Semi-volatile organics					
2,4,6-Trichlorophenol	5	3.91E-01	N/A	1.05E+00	1.05E+00
2,4-Dichlorophenol	5	1.13E+00	N/A	4.00E+00	1.05E+00
2-Methylnaphthalene	5	5.14E-01	N/A	1.05E+00	1.05E+00
Benzo(g,h,i)perylene	5	3.50E-01	N/A	1.00E+00	1.00E+00
Benzo(k)fluoranthene	5	4.04E-01	N/A	1.05E+00	1.05E+00
Benzoic Acid	5	1.35E+00	N/A	3.00E+00	3.00E+00
Chrysene	5	7.66E-01	N/A	3.00E+00	3.00E+00
Di-n-butylphthalate	5	2.04E-01	N/A	2.20E-01	2.20E-01
Dibenzofuran	5	2.04E-01	N/A	2.20E-01	2.20E-01
Fluoranthene	5	1.30E+00	N/A	5.30E+00	5.30E+00
Fluorene	5	2.50E-01	N/A	4.40E-01	4.40E-01
Indeno(1,2,3-cd)pyrene	5	3.70E-01	N/A	1.10E+00	1.10E+00
Naphthene	5	1.73E-01	N/A	2.20E-01	2.20E-01
Acenaphthene	5	2.38E-01	N/A	3.80E-01	3.80E-01
Anthracene	5	3.46E-01	N/A	1.00E+00	1.00E+00
Benzo(a)anthracene	5	6.72E-01	N/A	2.60E+00	2.60E+00
Benzo(a)pyrene	5	6.10E-01	N/A	2.20E+00	2.20E+00
Benzo(b)fluoranthene	5	3.39E-01	N/A	1.05E+00	1.05E+00
Phenanthrene	5	1.08E+00	N/A	4.30E+00	4.30E+00
Pyrene	5	1.35E+00	N/A	5.60E+00	5.60E+00
Pesticides					
delta-BHC	70	7.86E-01	1.74E+00	4.00E+01	1.74E+00
4,4'-DDD	117	8.66E-01	1.94E+00	7.50E+01	1.94E+00
4,4'-DDE	92	1.17E+00	2.54E+00	7.50E+01	2.54E+00
4,4'-DDT	120	9.56E-01	2.00E+00	7.50E+01	2.00E+00
Aldrin	124	7.14E+00	1.81E+01	8.20E+02	1.81E+01
alpha-Chlordane	125	1.71E+00	2.45E+00	4.00E+01	2.45E+00
gamma-Chlordane	125	1.71E+00	2.43E+00	4.00E+01	2.43E+00
Dieldrin	130	3.95E+00	5.66E+00	1.10E+02	5.66E+00
Endosulfan sulfate	71	1.51E+00	3.27E+00	7.50E+01	3.27E+00
Endosulfan II	60	3.94E-01	5.71E-01	3.10E+00	5.71E-01
Endrin ketone	70	1.46E+00	3.25E+00	7.50E+01	3.25E+00
Heptachlor	116	8.02E-01	1.18E+00	4.00E+01	1.18E+00
Heptachlor epoxide	72	7.76E-01	1.70E+00	4.00E+01	1.70E+00
Methoxychlor	70	1.71E+00	2.48E+00	1.55E+01	2.48E+00
MCPP (Mecoprop)	57	5.01E-01	7.20E-01	2.50E+00	7.20E-01
2,4,5-T	68	3.93E-02	7.01E-02	9.10E-01	7.01E-02
2,4-D	57	2.28E-01	4.57E-01	7.40E+00	4.57E-01
Dioxins					
2,3,7,8-TCDD	52	7.36E-05	1.11E-04	8.80E-04	1.11E-04
Inorganics					
Aluminum	28	8.18E+03	9.36E+03	1.37E+04	9.06E+03
Antimony	28	1.02E+00	1.25E+00	3.80E+00	1.25E+00
Arsenic	33	5.10E+00	6.36E+00	2.53E+01	6.36E+00
Barium	33	1.49E+02	1.75E+02	4.50E+02	1.75E+02
Beryllium	33	7.35E-01	8.73E-01	2.70E+00	8.73E-01
Cadmium	33	1.00E+00	1.36E+00	8.20E+00	1.36E+00
Chromium	33	2.58E+01	3.53E+01	1.57E+02	3.53E+01
Cobalt	33	7.73E+00	8.53E+00	1.48E+01	8.53E+00
Copper	33	1.01E+02	2.08E+02	2.08E+03	2.08E+02
Cyanide	33	1.38E-01	1.98E-01	9.80E-01	1.98E-01
Lead	33	1.99E+02	3.20E+02	1.77E+03	3.20E+02
Magnesium	33	5.62E+03	6.87E+03	1.99E+04	6.87E+03
Manganese	33	6.26E+02	6.94E+02	1.36E+03	6.94E+02
Mercury	33	9.58E-02	1.32E-01	5.00E-01	1.32E-01
Nickel	33	2.02E+01	2.44E+01	8.86E+01	2.44E+01
Selenium	33	5.84E-01	7.50E-01	2.00E+00	7.50E-01
Vanadium	33	2.42E+01	2.75E+01	7.21E+01	2.75E+01
Zinc	33	2.41E+02	3.73E+02	2.41E+03	3.73E+02

File: DICODA06.WK3

Appendix E

Exposed Soils OU4 Data With Exposure Point Concentrations For Current and Future Exposures OU4 Risk Assessment

Location	Sediment SP-B	Sediment SP-D	Surface Soil SS111-120	Exposure Point Concent-ration
Depth	0.5-1.0'	0.5-1.0'		(Maximum)
Analyte (all in PPM)				
Pesticides				
delta-BHC	0.001	0.0012	0.00115	1.20E-03
4,4'-DDD	0.0014	0.0019	0.0011	1.85E-03
4,4'-DDE	0.0038	0.0019	0.0045	4.50E-03
4,4'-DDT	0.01	0.0019	0.00099	1.00E-02
Aldrin	0.0058	0.0012	0.0115	1.15E-02
alpha-Chlordane	0.001	0.001	0.0047	4.70E-03
gamma-Chlordane	0.001	0.0016	0.005	5.00E-03
Dieldrin	0.011	0.015	0.0038	1.50E-02
Endrin ketone	0.0036	0.0029	0.00225	3.60E-03
Heptachlor epoxide	0.001	0.001	0.00066	1.00E-03

File: DICODA09.WK3